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ABSTRACT

This annotated bibliography is a compilation of books, articles, reviews, and other published and unpublished materials dealing with graduate education. The documents are divided into seven major categories: (1) history and development; (2) students; (3) structure and functions; (4) instruction and research; (5) manpower; (6) costs and financing; and (7) recommendations. (HS)

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AN ANNOTATED INTEROFFICE BIBLIOGRAPHY

ON GRADUATE EDUCATION

National Board on Graduate Education
Office of the Chairman
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F O R E W O R D

This annotated bibliography is a compilation of those books, articles, reviews, and other materials -- published and unpublished -- which were either sent to this office or brought to our attention between February 1 and April 30, 1972.

The categories used here are identical with those employed by Wayne C. Hall in his Annotated Bibliography on Graduate Education: 1950-1971. The initial pages for the categories are as follows:

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Edward L. Allen
Staff Associate
Champaign, Illinois
May, 1972

HISTORY AND DEVELOPMENT

-- Daniels, George

Science in American Society: A Social History.

New York: Alfred Knopf, 1971.

Daniels examines the role of science in the history of the United States, reviewing the development of its present status, its rhetoric, and its ideology and institutional framework. He sketches the developmental stages of science, dividing them into four periods: the colonial, the republican, the professional, and the imperial. The book offers an intellectual and historical framework out of which the present can be better understood by identifying the powerful sources of continuity in the past.

-- Gagnon, John H.

"A Review of Science in American Society: A Social History, by George Daniels"

Change, Vol. 4, No. 1, February, 1972, pp. 56-58.

In his book, Daniels examines the troubles facing universities regarding the funding of programs in the sciences, mathematics, and engineering. He also notes that a long and bloody struggle is sure to emerge regarding the redistribution of hard money within university budgets.

In his review of the book, Gagnon refers to it as an enlightening work which traces the history of the development of the present status of science, its rhetoric, ideology and institutional framework, and notes that Daniels pictures scientists as either saints or monsters. While Daniels sketches four stages in the development of science (the colonial, the republican, the professional, and the imperial), Gagnon feels that the illumination of the period before the First World War is immensely useful. Referring to the book as a detailed scholarly treatment of the role of science in the history of the United States, Gagnon suggests that the book is a useful manual for nonscientists in the university community who share committees with their colleagues in the sciences, and provides a better understanding of those endless speeches about the nobility of science and the defenses of distortions of university resources. It is, in Gagnon's view, a valuable survey, well-written and intelligently presented. He feels that it's major weakness lies in its minimal coverage of the scientific "imperium" of the last quarter century and its insufficient consideration of the social and modern biological sciences.

S T U D E N T S

-- Creager, John A.

The American Graduate Student: A Normative Description

Washington, D.C.: American Council on Education, 1971

Mr. Creager examines the findings from a survey conducted in the spring of 1969 by the Council and the Carnegie Commission on Higher Education providing graduate student's attitudes toward higher education and toward society in general.

-- Harvey, James

The Student in Graduate School

Washington, D.C.: American Association for Higher Education, 1972

Mr. Harvey assesses the major criticisms of doctoral education centering on the position of the graduate student.

CAREERS

-- Nelson, Jeffrey B.

"Two-year College Teachers in the Making"

American Education, March 1972, pp. 21-24.

Nelson examines the career orientation of young graduate students. He suggests that many of them do not want the discipline problems high school teachers must face, yet simultaneously reject the "Ph.D. syndrome" connected with university teaching. As a result, they are choosing teaching careers in community and junior colleges. He describes an experimental Master's degree program which seeks to determine whether it is desirable or even possible to train persons specifically for teaching on the two-year college level. The program is now in its first year at the State University of New York College at Fredonia.

STRUCTURE AND FUNCTIONS

-- Hall, Wayne C.

An Annotated Bibliography on Graduate Education, 1950-71

Washington, D.C.: National Research Council, 1971.

This work reviews the literature on graduate education which appeared between 1950 and 1971. It focuses upon the traditional areas of graduate education. References concerned mainly with other professional fields, degrees, and programs, such as medicine, law, theology, etc., in general are excluded.

ADMISSIONS

-- Howard, Bill

"Blacks and Professional Schools"

Change, Vol. 4, No. 1, February, 1972, pp. 13-16.

The author draws attention to the fact that black students are encountering difficulty gaining admission not only to white graduate schools, but also to the handful of historically black graduate and professional schools. Much of the attrition is attributed to the same drying up of federal and private support that has affected graduate education generally.

He bases much of his analysis on figures from the Office of Education and the Bureau of Labor Statistics. He also refers to the recent Carnegie Commission study of black higher education Between Two Worlds, by Frank Bowles and Frank A. DeCosta. He also cites studies conducted on black students in medicine and law.

It is also noted that difficulties encountered by blacks in white graduate schools have reached the point where a group of 125 black administrators and faculty have formed the ad hoc National Alliance for Graduate Education and Professional Training for Black People.

While the commitment on the part of graduate schools to assist minority students is seriously hindered by lack of funds, the author feels that at those schools where a strong commitment has been made, funds have been found.

INSTRUCTION AND RESEARCH

-- Orlans, Harold

The Nonprofit Research Institute

New York: McGraw-Hill Book Company, 1972

In this work, the ninth of a series of profiles sponsored by the Carnegie Commission on Higher Education, the author looks at the nonprofit research institute in light of its origin, its operation, its problems, and its prospects. He examines the agencies involved that have developed within the twentieth century and most dramatically since World War II. The impact of the 1969 Tax Reform Act on their operations is examined closely along with the effects of competition, the declining role of universities in institute management, the probabilities of the institutes' success in solving social problems, and the accounting that institutes must provide if the federal government is to evolve an informed policy toward them. He suggests that the social upheaval that began in the mid-sixties has had profound implication for these organizations. As a result of that upheaval, their funding, organization, operation, and the very basis for their justification have been brought under scrutiny. He argues that the public is concerned that technological development has been emphasized at the expense of social and economic ills. In response to this concern, many institutes are now diversifying their activities, undertaking work in the social sciences as well as the physical and biological sciences.

In part four, Orlans examines some trends and problems. Of special interest are the chapters in part four entitled, "Intersectoral Competition," and "University and Institute Research: Is the Balance Tilting?" In part five, the chapters "An Assessment," and "Recommendations" are of special interest.

-- Persell, Caroline

"The Quality of Research on Education: An Empirical Study of Researchers and Their Work"

New York: Columbia University, Bureau of Applied Social Research, 1972.

This is a report on a national panel of 40 eminent researchers which rated the quality of all papers read at the 1968 American Educational Research Association meeting and of all education-related research articles published in 113 journals in 1967-68. Also, the authors of the papers were surveyed and data regarding their education, careers, research settings, etc. were analyzed in relation to the quality of their research.

-- Stever, H. Guyford

"Proposed Increase in Civilian Research and Development Aimed at Improving Productivity and the Quality of Life - Basic Research Recognized"

Remarks made before the Committee on Science and Astronautics, House of Representatives, February 9, 1972. (Mimeographed.)

Testifying on National Science Foundation authorizations for fiscal year 1973, Dr. Stever pointed out that NSF occupies a strategic position in science and that it is significant that the continuing importance of basic research is recognized in the expanded efforts of NSF together with other science programs. He lists the major objectives of NSF for FY 1973:

- strengthen basic research to increase our fundamental knowledge and to provide the scientific underpinning needed for continued application of science and technology to the needs of the Nation;
- test incentives to encourage increased non-Federal investment in research and development;
- undertake selected efforts to focus research on national goals in major areas of domestic concerns; and,
- improve our understanding of science policies and the impact of R&D in our economy and society.

He also discusses the question of fundamental research support, research applied to national needs, and special program initiatives.

-- U. S. News and World Report

"Campus Research: A Giant in Trouble"

U. S. News and World Report, December 20, 1971, pp. 33-37.

This article examines the reasons for the recent decrease in research spending at universities and colleges. It notes that funding of projects connected with national security has dropped and funding for civilian programs has increased.

DEGREES

-- Abbott, Michael C.

"A Graduate Student Looks at the 'New' Doctor of Arts Degree"

AAUP Bulletin, Vol. 57, No. 3, Autumn, 1971, pp. 364-367.

The author examines the weaknesses and strengths of the D.A. degree. He notes that it may well prove to be an unsaleable commodity and decries attempts to strengthen the distinction between teaching and research.

-- American Association of State Colleges and Universities

The Doctor of Arts Degree: A Proposal for Guidelines

Washington, D.C.: American Association of State Colleges and Universities, 1970.

This booklet was prepared by the AASCU Committee on Graduate Studies. The report argues in favor of the Doctor of Arts degree. The authors note that the present interest in a Doctor of Arts degree or its equivalent springs from a number of needs. There is, for example, a definite need to provide another road to academic recognition and success, a road different from the Ph.D., particularly for those whose careers are in teaching. This other road is provided through the Doctor of Arts degree. There is also the need to recognize that a rapidly changing society requires a specialized type of teacher -- one who can synthesize knowledge, use the specialist's research for the advancement of man, and provide an important bridge for our public institutions in the multiple relationships they are developing with a variety of groups both on and off campus.

The topics treated include the following: 1) Requirements for Admission to the Program; 2) Selective Retention; 3) Resident Requirements; 4) Research Experience; 5) Program of Study; 6) Length of Program; 7) Examinations; 8) Library Resources; and 9) Faculty.

-- Council of Graduate Schools in the United States

Supplemental Statement on the Doctor of Arts Degree

Washington, D.C.: The Council of Graduate Schools in the United States, 1972.

This is the second of two booklets published by CGS dealing with the Doctor of Arts degree. It is a revision of the first booklet which was published in March of 1970. While the Doctor of Arts degree is referred to as a fait accompli in the revised version, it is also characterized as an evolving degree and the new statement reflects study and assessment of current trends and developments. Topics discussed include the following: 1) Rationale for the Degree; 2) Institutional Qualifications; 3) Characteristics of Teaching Scholars; 4) Control and Organization; 5) General Requirements; 6) Academic Content; 7) Professional Components and the Internships; and 8) Research Components.

In summarizing, the following position is taken. The Doctor of Arts should be granted only by those institutions which have the physical and intellectual resources to offer advanced graduate study leading to doctoral degrees. The issue is not whether the degree is comparable to traditional research degrees or will replace existent professional degrees which provide certain specialized expertise in academic life. The admission and retention of graduate students should be as rigorous as for the research doctorate. The Council views the Doctor of Arts as a degree to prepare professional, academically well-qualified teaching scholars for college classrooms. Experimental and evolutionary though the degree may be at this point in time, the single general standard which must be applied in all respects is that of high quality. This can and will be assured only if the universities provide such quality as they develop the Doctor of Arts degree.

-- Mayhew, Lewis B.

"Jottings"

Change, Vol. 4, No. 1, February 1972, pp. 54-55.

The author examines those forces he feels will force graduate faculties to change and undertake serious reform. He also examines questions regarding degree structures and programs.

-- National Academy of Sciences

The Invisible University: Postdoctoral Education in the United States

Washington, D.C.: National Academy of Sciences, 1969.

This work, a report of a study conducted under the auspices of the National Research Council, is the result of a concern within the NRC and elsewhere about the scope of postdoctoral education in the U. S. The purpose of this study was to provide the basic facts about postdoctoral study as it exists in the United States today so that those entrusted with academic, administrative, and legislative responsibilities could better cope with perceived problems.

Topics include: an historical view; the demography of postdoctoral education; implication for the postdoctoral; implications for academic institutions; implications for nonacademic institutions; the foreign postdoctoral; the finances of postdoctoral education; and a summary of conclusions.

-- Proctor, Alvin H.

The Doctor of Arts Degree

Washington, D.C.: Council on Graduate Schools in the United States, 1970

This statement concerning the Doctor of Arts degree was prepared for Council on Graduate Schools in the U. S. by the Committee on the Preparation of College Teachers. It is in response to requests from governmental agencies, graduate deans, and other educators. The statement is submitted in the belief that 2 premises are of prime importance: that the new degree should be offered in well-established universities which already offer the Ph.D. in order that the Doctor of Arts may utilize the academic validity and reputation of graduate study in those universities thus ensuring high standards and its acceptance as a new degree in graduate education. Moreover, the Council of Graduate Schools through the inherent nature of this organization should describe essential characteristics and provide guidelines for future development at other institutions.

The statement includes the rationale for such a degree, as well as its general and special characteristics.

-- Stever, H. Guyford

"Doctor of Arts Degree"

Science, Vol. 170, No. 3958, November 6, 1970, p. 587.

This is an editorial describing the rationale for the D.A. degree. Stever notes slow acceptance and calls for broader support.

PROGRAMS

-- Breneman, David W.

The Ph.D. Degree at Berkeley: Interviews, Placement, and Recommendations

Berkeley: University of California, Office of the Vice President - Planning and Analysis, 1971.

This is one among a series of reports sponsored by the Ford Foundation (Research Program in University Administration at the University of California, Berkeley). It is the third of three papers analyzing departmental variations in time to degree and attrition in 28 Ph.D. programs at the University of California, Berkeley.

-- Elton, Charles F., and Rodgers, Samuel A.

"Physics Department Ratings: Another Evaluation"

Science, Vol. 174, No. 4009, November 5, 1971, pp. 565-568.

The authors look at evaluation procedures in graduate education and conclude that objective variables provided a good approximation of the numerical ratings of the graduate programs in the Cartter study. But they feel additional correlates of departmental ratings are warranted.

-- Koenker, Robert H.

"Status of the Doctor of Arts Degree Programs for Preparing Junior College and College Teachers"

Unpublished paper. Graduate School, Ball State University, Muncie, Indiana, November 22, 1971. (Mimeographed.)

Report of a nation-wide survey of the status of the D.A. degree for preparing Junior College and college teachers. It provides a listing of 76 institutions which offer, or were planning to offer, or were considering the possibility of offering the D.A. degree. The graduate deans of the 288 member institutions of the Council of Graduate Schools in the United States were sent the questionnaires used in the study.

In summary, it would appear that the D.A. degree is becoming more widely accepted and recognized. In March, 1970, there were 76 institutions which offered, were planning to offer, or were considering the possibility of offering the D.A. degree. The number of such institutions had increased to 87 by November, 1971, in spite of the increased oversupply of Ph.D.'s, the financial restrictions placed on many institutions, and the fact that a number of state coordinating boards have ruled against the establishment of new doctoral programs.

-- Lemonick, Aaron

"The Plight of the Graduate School: One Dean's Views"

Princeton University. Unpublished paper, 1972.

A dean of the graduate college at Princeton University examines the impact of fiscal restraints on students and graduate programs in general. He points to the grim facts of decreasing external support which, he fears, will cut so deeply into the number of graduate students, that there will result a lowering of the standard of excellence in graduate students and graduate education. Referring to the projected Ph.D. oversupply, he suggests that unless students stop coming, or enrollments are cut back, the projections will come true. While Princeton Ph.D.'s are still getting jobs, the "remedial" steps taken by the Federal government are hitting hardest at quality institutions.

He illustrates his arguments by pointing to the fact that at Princeton the number of graduate students supported by outside funds of all sorts, government, foundations, and corporate, will have gone from about 1,060 in 1969-70 to about 550 in 1973-74. During these same years, the number supported by University funds will have risen from 420 to 690. The situation may go to the point where some entire graduate programs must disappear from the curriculum in order not to weaken all of them.

In brief, graduate schools are feeling a sharp, shock-wave-like decrease in graduate support funds from outside sources. The largest part of the decrease is caused by the reduction or termination of federally funded programs. This massive curtailment in support threatens to do real injury to graduate schools. In many cases graduate schools have already significantly reduced the size of entering classes. Further reductions will mean not only lost opportunities for students who merit the best doctoral education we have to offer, but far more serious for the long run, these reductions will hurt quality graduate education in the nation, because these same institutions will be forced to discontinue entire Ph.D. programs which stand among the best.

-- Quad-Cities Graduate Study Center

Annual Report, 1971

Rock Island, Illinois: Quad-Cities Graduate Study Center, 1971.

The report details the features of the Center, which is a consortium of nine colleges and universities in Illinois and Iowa. All of the institutions support graduate programs; five at the master's degree level. During the 1971-72 academic year, almost 3,000 registrants were involved in full- and part-time study. The Center has no minimum as residence requirement, and the transfer of credit within the consortium is maximized.

Those institutions included in the consortium are the following: In Illinois - Augustana College, Northern Illinois University, Southern Illinois University, University of Illinois, Western Illinois University; in Iowa - Iowa State University, Marycrest College, University of Iowa, University of Northern Iowa.

-- Roose, Kenneth D., and Andersen, Charles J.

A Rating of Graduate Programs

Washington, D.C.: American Council on Education, 1970.

This report presents the principal findings of the 1969 Survey of Graduate Education, a study similar in concept and conduct to the one directed by Allan M. Cartter in 1964 and described in his An Assessment of Quality in Graduate Education, published by the American Council on Education in 1966. A fundamental purpose of the report is to furnish prospective graduate students with information on faculties and programs.

M A N P O W E R

-- Balderston, F. E. and Radner, Roy

Academic Demand for New Ph.D.'s, 1970-90: Its Sensitivity to Alternate Policies

Berkeley: University of California, Office of the Vice President-Planning, 1971.

This report is one of a series of reports of the Ford Foundation sponsored Research Program in University Administration at the University of California, Berkeley. The paper investigates the plausibility of various projections of academic demand for doctorates over the next two decades. It examines the contributions to this demand by different sectors of higher education and offers some policy implications relevant for various decision-makers involved in higher education.

It does not deal with the question of supply nor investigate prospects for employment of new doctorates in industrial and governmental research and professional work, as distinct from faculty appointment in colleges and universities. However, it treats in some detail the plausibility of recent projections of academic demand for new doctorates, examines the possible contributions to this demand by each major sector of American higher education, and seeks to illumine some positive policy choices in the financing and staffing standards of higher education.

-- Board of Higher Education, State of Illinois

"Committee V: Engineering"

Springfield, Illinois: State Board of Higher Education, October, 1970. Unpublished report. (Mimeographed.)

The charge to "Committee V: Engineering" was to answer the following questions: 1) What are the trends in the supply and demand for professional personnel in Engineering?; 2) If the supply is insufficient, how should the production of professional personnel be increased?; and 3) How can graduate and professional education in Engineering be improved? The three major topics covered in the report are the trends in the supply and demand for professional personnel in engineering, an approach to increased production of professional personnel, and methods of improving graduate and professional education in engineering.

The Committee's general findings and recommendations included, among other statements, the following:

General Findings: The technological level of industry within the State of Illinois must rise continually to meet both foreign and domestic competition. Solution of the problems of pollution, health care, and many other problems of urban and rural society will require the continuing attention of the brightest and most highly educated of engineers in ever increasing numbers. Therefore, the well-being of the country as a whole and the citizens of the State depend critically upon educating engineering students and engineers in practice to

the highest level of their capabilities and aspirations in order to maximize the contribution of this small but vital fraction of our population.

Recommendations: Planning should be authorized for the substantial addition of buildings, equipment, and staff needed to permit this growth from the present level of about 650 master's and 250 doctor's degrees in engineering per year to about 2100 master's and 600 doctor's by 1980.

-- Bock, Robert M.

"Ph.D.'s Coming and Going"

Science, Vol. 173, 2 July 1971, pp. 6-7.

In a letter to the Editor, the author supports Allan Cartter's call for more objective and thorough skilled manpower forecasting. He sees signs of a new public dogma of "gluttism" emerging which derives from the present forecasts that by 1980 there will be 48,000 - 80,000 new Ph.D.'s annually.

On the basis of the April 1971 survey of programs at Wisconsin, they are convinced that these projections are much too high and fail to take full account of the remarkable adjustments that are occurring.

At Wisconsin Ph.D. output will continue to climb and reach a plateau in 1971-72. After 1972-73, a decline will begin and continue until at least 1975-76. There will most likely be a similar decline in other top institutions.

Rate of growth of the past decade, based upon availability of public resources, cannot be sustained even by newer or "emerging" institutions. State or Federal funds for such expansion will not be available.

Bock therefore predicts that the level of Ph.D. output in 1980 is likely to exceed 1971 level only to the extent that the emerging institutions can afford the great financial sacrifice of growth with their own funds.

To survive, those institutions must achieve a quality acceptable to the students who personally shoulder much of the cost, depending upon new funds that might be generated to fill specific manpower shortages, or depending upon the chance that there might be a reversal of the current strong reaction of state and federal policy to Cartter's projections. If the supply curve is different than that predicted by Cartter, then the current state and federal policies may lead to sweeping dismantling of public support programs for the training of scientific manpower. Then tragic damage may be done in many fields.

-- Brode, Wallace R.

"Manpower in Science and Engineering, Based on a Saturation Model"

Science, Vol. 173, No. 3993, July 16, 1971, pp. 206-213.

The author examines the assumption that young people are turning away from science in greater numbers than ever before. They argue that one could with equal proof substantiate the argument that young people are turning toward science in greater numbers than ever before.

They examine: 1) Approaching Ceilings in Scientific and Technological Manpower; 2) Career Selection in Science and Engineering; 3) Changing Size of the College-Age Population; 4) A Holding Pattern for Today's Surplus; 5) Ratio of B.S.'s to Ph.D.'s as a Measure of an Area's Development; 6) the Prospect of a Shortage of Scientists and Engineers; 7) Suggested Cures for the Problems of the Surplus; 8) Census Projections; and 9) A Manpower Employment and Training Act.

Proper presentation of the short-term need for preserving the technical abilities of those people whose careers require long training periods and who will be in short supply in the near future should enable the Congress to obtain presidential approval for a ready reserve program as part of a revised manpower employment and training act in the current session of Congress.

-- Cartter, Allan

"Ph.D.'s Coming and Going"

Science, Vol. 173, July 2, 1971, pp. 6-7.

In a response to several letters to the Editor, Allan Cartter replies that Mazur and Einhorn are rightfully concerned with maintaining institutional vitality in the next two decades. Higher education could stagnate if some means is not found for a constant influx of bright young scholars. While expansion of the market has long provided that opportunity, the next 20 years could make the colleges look like the American railroad today.

Spengler is rightfully concerned with the individual's welfare and his potential contribution. Cartter shares those concerns and was simply arguing in his proposal that a faculty should have the option of replacing a colleague who has not retained his scholarly prowess after 25 years, and that all professors should have the option of seeking a new career or opportunity for service without major financial risk.

He shares Bock's concluding sentiments and has pleaded for an understanding and sustaining federal policy. He does not feel as optimistic as Bock about the possibility of stabilizing doctoral output in many fields. He feels Wisconsin's is somewhat unique in that Wisconsin has done a better job than most states in preventing the proliferation of graduate programs.

-- Cartter, Allan M.

"Scientific Manpower for 1970-1985"

Science, Vol. 172, No. 3979, April 9, 1971, pp. 132-140.

This article is based on an address given at the AAAS meeting in Chicago, December 27, 1970. It restates the thesis that the oversupply of Ph.D.'s will seriously affect higher education and national science policy. He argues that today's problems should not be attributed to just a temporary cutback in federal funds for education, research, and development. We have created a graduate education and research establishment in American universities that is about 30 to 50% larger than what we shall effectively use in the 1970's and early 1980's, and the growth process continues in many sectors.

Cartter points to studies done by OE and NSF in the late sixties which should have been warning signals of the impending oversupply. He makes a plea that some group coordinate efforts at estimating projecting needs and resources so that they may be made on mutually consistent assumptions.

Cartter believes it is urgently necessary for the federal government to identify a category of "national universities," perhaps 75 to 100 in number, and guarantee certain minimum support levels for graduate education, research, and student aid.

In an important sense, there is not a significant oversupply of persons trained at the doctoral level today. If the economy had proceeded at a near full employment level since 1968, the subject of this paper would not begin to attract attention for several years. If his analysis of the academic labor market is correct, however, the problem would have begun to emerge about 1969, but would not have become fully evident until the mid-1970's. The present recession, and most particularly the sharp federal cutbacks in education and R & D support, have given us several years' lead time in anticipating the more severe, real disequilibrium that looms in the years 1978 to 1990.

-- Drucker, Daniel C.

"Is the Future Bright or Bleak?"

Midwest Engineer, Vol. 24, No. 3, December, 1971, p. 4

This article is based on a talk originally given before the Western Society of Engineers on November 10, 1971. In his examination of the current role of the engineer, the author points to four present and emerging points of agreement about engineers which are "disastrous nonsense." These points of agreement are: 1) We should discourage as many engineering students and engineers from going on to graduate study, doctoral study in particular, because there will be little demand for them; 2) We should establish professional schools of engineering which the student would enter in his junior year and in which engineering practice rather than research would be emphasized; 3) All engineers should be well enough in the useful social and behavioral sciences that upon graduation, they can solve the pressing social and political problems of society; and 4) We should abandon the traditional American goal of unlimited educational opportunity for all who can qualify, because we have come sufficiently close to achieving that goal.

Drucker argues against all four of these positions and also argues that the higher the level of education for any given group, the lower the level of unemployment for that group. Finally, he also argues against narrow specialization within the field of engineering.

-- Folger, John K., Astin, Helen S., and Bayer, Alan E.

Human Resources and Higher Education

New York: Russell Sage Foundation, 1970.

Beginning with the premise that how the nation develops and utilizes its human resources is determined by millions of individual decisions, each made for quite personal reasons and free choice, the authors sought to examine the fundamental characteristics of the system. The study is the result of their work for the Commission on Human Resources and Advanced Education.

The study includes chapters on the following topics: 1) Summary of Manpower Problems and Issues Facing the Nation, 2) The Market for College Graduates, 3) The Supply and Demand for Graduates in the Arts and Sciences, 4) Manpower Supply and Demand in Selected Professions; 5) The Flow of Students Through the Educational System, 6) Career Plans of High School and College Students, 7) the Mobility of High-Level Manpower, 8) Determinants of Professional Achievement and Rewards, 9) The Educational and Vocational Development of Women, 10) Talent Development Among Low Socioeconomic Groups, 11) The Effect of International Interchange of High-Level Manpower on the United States, 12) Manpower Planning and Manpower Market Operations, and 13) Research Needed on Talented Manpower.

Each chapter includes a summary and conclusions.

-- Freeman, Richard B.

"The Science Manpower Market in the 1970's"

Washington, D.C.: The National Science Board, 1972. Draft of a larger and unpublished study. (Mimeographed.)

Those topics treated by Mr. Freeman include the following: 1) The extent of the problem in the science manpower market; 2) Factors affecting the science manpower market. Proposition 1 - The science manpower market is governed by an endogenous mechanism that casues periodic shifts in supply-demand conditions and in resultant "shortages" and "surpluses." Proposition 2 - The R & D and manpower policies of the federal government have been the principal initiators of "shocks" causing cyclic fluctuation in the science market and have exacerbated adjustment problems. 3) Adjustments in the Manpower Market. Proposition 3 - Econometric analysis of the pattern of change in the starting rates of scientific and other college-trained specialists over the entire post-World War II period provides estimates of the responsiveness of salaries to market conditions in general.

Proposition 4 - The theory of derived demand tells us that change in salaries causes, cet. par., changes in demand for workers. Proposition 5 - The supply of workers, also, adjusts to changed economic conditions with young persons in particular showing great responsiveness to economic incentives. Proposition 6 - Experienced workers, also, adjust to changed conditions. 4) Forecasts of the Science Manpower Market; The Manpower Model.

-- Ginzberg, Eli

"The Outlook for Educated Manpower"

The Public Interest, No. 26, Winter, 1972, pp. 100-111.

The author points to the considerable evidences of trouble concerning the high unemployment rate among university trained people, but argues that the situation may not be as desperate as many think.

He examines the reasons for the high unemployment rate; the failure of monitoring agencies to anticipate the surpluses; the question of whether or not the current dire situation will be a short-lived or an extended one; the kinds of efforts employed to adjust to the current supply and demand problems; and recommends that the following steps be taken: 1) To take account in federal budget making of the manpower (particularly educated manpower) implications of the initiation, expansion, and continuation of large military and civilian programs; 2) To develop a long-run policy for the federal support of science, with regard to both level and rate of growth. Since the federal share is 60 per cent of a $28 billion total, erratic fluctuations are certain to cause serious manpower distortions; 3) To evolve a long-run federal policy for the support of higher education (doctoral programs) that will help to keep solvent the 100 or so principal university centers and that will provide support for graduate students through a judicious mixture of grants and loans; 4) To consider alternative staffing arrangements in launching or expanding large federal programs -- e.g., health -- with the aim of economizing in the use of specialists with long periods of training. The Dean of Utah's Medical School has recently warned about the danger of a prospective oversupply of physicians, a warning that Ginzberg has sounded earlier.

-- Gordon, Margaret S.

"The Changing Labor Market for College Graduates"

Berkeley: Institute of Industrial Relations, 1971. (Mimeographed.)

This paper represents a partial and preliminary draft of the second chapter of a proposed volume of essays. The work, to be entitled Higher Education and the Labor Market, is being prepared in cooperation with the Institute of Industrial Relations at Berkeley.

-- Harvey, James

"Ph.D.'s and the Market Place"

Research Currents, (ERIC Clearinghouse on Higher Education, George Washington University, Washington, D.C.), February 1, 1972, p. 3.

This report is a review of the literature relating to the manpower debate. It includes a bibliography. It also suggests favorable and unfavorable outlooks for the following: Humanities; Social Sciences; Physical Sciences; Biological Sciences; Engineering; and Mathematics. The author concludes: It is hard to argue with the overwhelming evidence that if current trends continue, too many Ph.D.'s will be produced. However, few analysts would agree that substantial unemployment of Ph.D.'s will result. Instead, it is expected that education requirements for various positions will be upgraded and the Ph.D.'s will "bump" people with master's degrees from their positions. However, if there will not be massive unemployment, the amount of underemployment -- the use of Ph.D.'s in positions not allowing them to utilize their research skills -- will increase. It is essential that graduate students, particularly at developing institutions, be informed of this outlook.

Ph.D. manpower is expensive to produce. To utilize it fully, federal policies to expand research and development funds in areas of pressing social concerns should be encouraged. Transportation, housing, environmental and medical problems could be investigated by using humanists, social, bio- and physical scientists, and engineers. The manpower is too valuable and the social needs too pressing to allow doctoral recipients to waste their talents in unsuitable positions.

-- Jacobson, Robert L.

"Ph.D. Surplus Seen Overestimated"

The Chronicle of Higher Education, Vol. VI, No. 24, March 20, 1972, p. 3.

This is a review of a report by Laurence B. DeWitt and A. Dale Tussing, two economists at the federally supported educational policy division of the Syracuse University Research Corporation, contracted for by the U. S. Office of Education. The title of the report is not given.

The authors argue that the projected surpluses of Ph.D.'s and public school teachers in the 1970's probably will not be as severe as some studies have suggested. They advise federal officials to respond cautiously to the projections, lest they help turn surpluses into shortages. They acknowledge that there would be a fairly considerable overproduction of Ph.D.'s in this decade (400,000 produced compared with a demand for 190,000), but they had a number of reservations about those figures. They disputed prediction that government and industry would need only about 63,000 new Ph.D.'s in the '70's on the basis of past trends, and implied that the demand would be much greater and that virtually all Ph.D.'s not taken by academic institutions would be hired by government and industry.

The main problem, they said, was more likely to be underemployment -- the use of Ph.D.'s in positions for which they were "overqualified." Also, warning of a technology gap between the U. S. and other countries might well spur demands for more highly trained personnel in this country.

Their own estimate of the demand for Ph.D.'s in higher education was about 33,000 more than had been forecast a year earlier by Allan M. Cartter. They also challenged the "trend projection" that the teacher surplus for elementary and secondary schools would total 100,000 to 150,000 a year for the next decade. Either the demand will be greater than anticipated, they said, or the supply will be less, or both.

Regarding bachelor's degree recipients, they cited recent studies suggesting that the tight job market was due largely to a presumably short-term recession. But they called on the federal government to examine whether it was not spending a lot of money on "over-training the American work force."

-- Mazur, Allan and Einhorn, Martin

"Ph.D.'s Coming and Going"

Science, Vol. 173, July 2, 1971, pp. 6-7.

In a letter to the Editor, commenting on Allan Cartter's suggestion that retirement age be lowered to 64 to make more room for younger people, Mazur and Einhorn argue that one year is not enough and ask why not make the retirement age 60 or even 55. Adequate pensions could be fixed and arrangements made to use their skills outside academe. They argue that the benefits of a lowered retirement age would break the "tenured hold of unproductive older professors on scarce faculty positions."

-- National Science Foundation

Graduate Student Support and Manpower Resources in Graduate Science Eduation, Fall 1970

Washington, D.C.: U. S. Government Printing Office, 1971.

As a result of a policy decision by the present administration to replace direct grants with guaranteed loans, Federal support for graduate traineeships and fellowships have declined sharply in the last few years. Administration spokesmen have argued that increased numbers of research assistantships brought about through increased Federal support for project research at least in part offsets the drop in traineeships and fellowships.

The major conclusion to be drawn from the data presented in this report is that the arguments presented by the Administration spokesmen are not true. According to this report, the data show Federally sponsored research assistantships are declining also. The report also analyzes the changes in full-time graduate enrollment by broad discipline categories, such as engineering, mathematics, life sciences, and so on.

-- Perloff, Robert

"Enhancing Psychology by Assessing Its Manpower"

American Psychologist, Vol. 27, No. 5, May, 1972.

As the guest editor of a special issue of the American Psychologist, Perloff examines the manpower question relative to the field of psychology. He looks closely at manpower predictions and career choices, manpower demands and training implications, the question of whether or not there is a Ph.D. glut, the need for manpower monitoring programs and finally, remediation strategies.

He notes that the effects of illusory prognostications not only play havoc with the plans of training institutions and other organizations, but they also may have disasterous implication for the morale and careers of young people. Commenting on the APA Task Force on Manpower Demands and Training Implications, he points out that the chief recommendation of the Task Force was that a continuous personnel monitoring system or job clearing-house be established, making possible at any given point in time answers to questions about manpower which are presently essentially speculative.

-- Semas, Philip W.

"Graduate-School Trends Alternately Worry and Cheer Deans"

Chronicle of Higher Education, December 13, 1971.

This article reports on the discussions at the annual meeting of the Council of Graduate Schools in the United States. A great deal of attention is given to the questions of manpower and enrollments.

-- Shull, Harrison

"The Crisis of Confidence"

Paper prepared for the Association of Graduate Schools Annual Meeting, Minneapolis, Minnesota, October 22, 1971. (Mimeographed.)

The author takes issue with those who feel we are producing too many Ph.D.'s and feels fundamental research in science (research oriented Ph.D.'s) will and should continue its major role.

-- Spengler, Joseph T.

"Ph.D.'s Coming and Going"

Science, Vol. 173, July 2, 1971, pp. 6-7.

In a letter to the Editor, the argument is made that Cartter's otherwise very fine paper on manpower is marred by his proposal that professors be retired at age 64 or earlier. Using figures from a 1967 life table, Spengler questions whether a man retiring at 64 could have earned enough to support himself comfortably in his remaining years, given present or prospective post-retirement life expectancy. He also questions whether or not the half salary retirement scheme following 25 years of service regardless of age, as proposed by Cartter, would allow a person to be able to spend his or her remaining years in comfort. In addition, he wonders whether the economy or those in the lower age brackets would or could sustain such an arrangement.

Cartter's suggested arrangements, he feels, overlook the almost inevitable decline in the purchasing power of the pension dollar, and the denial to the retiree of a share in the increase in output associated with public investment. Spengler feels that only his ability to exercise his right to work is likely to guard the individual against inflation and other security-eroding forces.

-- Wolfe, Dael and Kidd, Charles V.

"The Future Market for Ph.D.'s"

Science. Vol. 173, No. 3999, August 27, 1971, pp. 781-793.

The article examines: 1) the impact of the increased rate of Ph.D. production upon policy issues for universities and government; and 2) the differences in the rates of increase projected, in the assumptions on which the projections were based, in the methods employed, and in some of the implications for national policy and university plans.

The authors summarize and interpret a great deal of recent work on both supply projections and demand analysis. The discussion draws on documents and comments from an informal conference held on April 2, 1971, in Washington, D.C. Topics include: Doctoral Supply; Utilization; The Market in the 70's; Growth in Selected Areas; Market in the 80's; Reliability of the Projections; Better Information and Analysis Needed; Implications of a Buyer's Market; Increasing Demand; Restraining Expansion; Collective Action.

The authors conclude that even if agreement on "Solutions" is reached, the processes of adjustment will be difficult. More stringent admission standards, quotas, reduced financial support, incentives, or other means of controlling the number of doctorates will challenge established values, frustrate many students and many professors, exacerbate tensions among established and emerging institutions, aggravate the uneasy relationships between universities and government, complicate faculty-administration problems, and accentuate differences between older and younger faculty members. Some academicians will no doubt be inclined to the view that difficulties in the job market for young doctorates created by a laissez-faire approach are moderate compared with the difficulties that will be generated by efforts to adjust supply and demand.

They are also of the opinion that these problems must be faced, and that the long-range inbalance, inequities, and strains arising from ignoring the problem will far outweigh the stresses generated by efforts to cope with it.

EMPLOYMENT

-- Polinger, Madeleine

"Chemical Employment Should Bottom Out in 1972"

Chemistry and Engineering News, Vol. 50, No. 13, March 27, 1972, pp. 10-11.

The author reports that while there will most likely not be an overall upturn in chemical jobs until 1973, a few companies have increased recruiting and hiring this year. In some instances, companies have increased campus recruiting and a survey conducted by the College Placement Council shows that drug and chemical employers are expected to hire 14% more graduates in 1972 than in 1971. The author also notes that employment prospects for chemists and chemical engineers within the Federal government remain about the same and that the tight supply of academic positions may have loosened up a bit.

ENROLLMENT

-- Burns, Richard L.

Report on the Council of Graduate Schools - Graduate Record Examinations Board 1971-72 Survey of Graduate Enrollment

Princeton, N.J.: Education Testing Service, 1972

This report analyzes the results of a survey of 298 graduate institutions which grant Master's or doctorate conducted jointly by GRE Board and CGS. The author concludes that while graduate enrollments overall seem to be stabilizing, there is no sharp downturn, despite substantial decline in available support.

- Federal Interagency Committee on Education

"Pre-doctoral Fellowships and Traineeships"

Washington, D.C.: U. S. Government Printing Office, 1972.

This two page listing presents figures for the 1970, 1971, and 1972 fiscal years on fellowship and traineeship grants provided by federal agencies. In general, the total dollars awarded by the several agencies has decreased by $59,368 during the three-year period. Only two agencies, EPA and the Office of Education, show increased expenditures during the time span in question. The increases were in the amounts of $1,434 for EPA and $35,016 for the Office of Education.

PLANNING

-- Metz, David

"Ph.D.'s Should Be Planned"

New Scientist, Vol. 53, No. 783, February 17, 1972, pp. 386-388.

Looking at the role of the Ph.D. degree in British universities, Metz asks whether work done in pursuit of the degree should continue to be regarded as vocational training in which research methods are learned, or whether the degree should be thought of as a rather advanced general education for the "Higher fliers." He argues that even with no increase in the numbers of Ph.D. candidates, Britain's pool of Ph.D. scientists will eventually double. He feels prospects for employing them fully are gloomy and calls for the establishment of a new manpower planning body.

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UTILIZATION

-- Harmon, Lindsey R.

Mobility of Ph.D.'s

Washington, D.C.: National Academy of Sciences, 1971.

This study was undertaken with the support of the National Institute of Health. The analysis begins with the premise that social, economic, disciplinary, and occupational mobility characterize all but the very poorest of our society. These kinds of mobility are highly important for the country as a whole and for the academic community in particular.

The report is concerned specifically with the mobility of holders of the doctorate. Immigration and internal migration are both considered, as are the factors that govern mobility among disciplines and occupations. The topics treated include the following: 1) International Migration; 2) History and Geography of U. S. Doctorate Output; 3) A Computerized Distance/Direction, Origin/Destination Metric; 4) State Indices of Prosperity and Education; and 5) Mobility After the Ph.D.

-- Morris, Jeffrey

Educational Training and Careers of Ph.D. Holders: An Exploratory Empirical Study

Berkeley: University of California - Ford Foundation Program for Research in University Administration, 1972.

This is one of a series of reports of the Ford Foundation Research Program in University Administration at University of California, Berkeley. This study analyzes the occupational mobility of individuals who hold the Ph.D. degree. Drawing upon data contained in the National Register of

Scientific and Technical Personnel compiled by the National Science Foundation, this paper presents the quantitative relationships between educational background, occupational mobility, and salaries. Based on these results, the author then presents and empirically tests an economic theory of Ph.D. occupational mobility.

The topics treated include: 1) Descriptive Data - Field of Ph.D. Degree and of Greatest Scientific Competence, Employment Speciality Field and Associated Salary, Job Mobility, Educational Background; and 2) Interpretations of the Descriptive Data and Tests of Some Hypotheses - The Relationship Between Occupational Mobility and Educational Background, A Theory of Ph.D. Occupational Mobility, The Relationship Between Salary and Educational Background, and Ph.D. Employer Mobility: Down a One-Way Street?

COSTS AND FINANCING

FEDERAL SUPPORT

-- Farber, M.A.

"Deans Say Lag in U. S. Aid Hinders Graduate Schools"

New York Times, December 5, 1971.

Referring to recent poll of professors by the American Council of Education, the author discusses the question of funding and decrease in enrollments and size of programs.

-- Young, M. Crawford, and Bock, Robert M.

"Hard Times for the Graduate Schools"

Change, Vol. 3 , No. 4 , Summer 1971, pp. 20-22.

The authors examine the nation-wide erosion of support for graduate education as it affects one institution, the University of Wisconsin. Having listed several examples of how the shrinkage of federal funds has adversely affected programs, the authors raise two questions: How will graduate programs respond to the prospect of contraction? What will happen to the prospective students in biomedical fields, which will be particularly damaged by the possibility of dismantling the whole training grant system?

They conclude that remarkable adjustments have already occurred through cutbacks in enrollments. While the primary reason for the cutbacks seem to be based on the premise that there are too many Ph.D.'s, the problem of oversupply is actually selective and limited. For example, of 106 graduate departments and programs at Wisconsin, only 10 reported in March of 1971 a severe surplus situation; 29 indicated some surplus, while 50 found no surplus problem at all. Seventeen declared that there continued to be a deficit in their fields. While noting that other major institutions are moving in the same direction, the authors question whether institutions newly entered into the doctoral arena will seek to maintain or expand their present numbers.

They call attention to the view of those who feel that graduate education should be paid for entirely (through loans) by the student, not the society. While student loans may be very beneficial as a supplement, the authors argue, as a substitute, such loans are one additional threat to the survival of quality graduate education.

They suggest that we must fall back upon the hope that, when the decisive moment comes, the federal government will draw back from the extreme consequence of simply liquidating its assortment of graduate fellowship programs.

They conclude that present forecasts of catastrophic oversupply for the 1970's are at the very least, exaggerated. Changes already made could prove them wholly wrong. It would be a grave disservice to the public to dismantle the whole superstructure of graduate education on the basis of such uncertain evidence.

R E C O M M E N D A T I O N S

PURPOSES AND GOALS

-- Hackerman, Norman

"The Future of Graduate Education, If Any"

Science, Vol. 175, No. 4021, February 4, 1972, p. 475.

The author examines our possibilities regarding the future of graduate education: 1) to continue seeking increased support for increased costs, as well as for expansion; 2) to (self-) limit proliferation on the individual campus by not acceding to the "attraction" argument; 3) to limit the number of universities offering a broad spectrum of courses; and 4) to decide that the enhancement no longer obtains and, therefore, to separate graduate from undergraduate education.

-- Heiss, Ann M.

"Graduate Education in A Society in Transition: A Working Paper"

Washington, D.C.: National Board on Graduate Education, March, 1972. (Mimeographed.)

The author examines the current state of graduate education and presents a synthesis of recent research findings and a digest of the recommendations proposed by knowledgeable groups or persons who have given serious thought to the future of graduate education. Her focus, except in a few classic studies, is on the research literature published within the past five-year period and on the recommendations proposed during that same period. She suggests that those recommendations may serve as a basis on which rational discourse might begin. Included is a digest of recommendations made by various Assemblies, Boards, Commissions and Councils.

-- Kaysen, Carl

The Higher Learning, the Universities, and the Public

Princeton, N.J.: Princeton University Press, 1969.

Essentially an essay, the book examines the social functions of the American university in relation to its basis of financial support. The first two chapters contain the text of two Stafford Little lectures for 1967-68 delivered on February 6 and 8, 1968. The remainder of the book is devoted to indicating the way in which the author would answer the main question raised in the lectures.

The author's main thesis is that the basis on which much of the growing support from the public treasury has been asked and given in recent years does not correspond to what universities are actually doing. He reviews the development of the American graduate school and then examines the justifications that have been advanced for public support of science and learning.

The author argues in the third and final chapter that because it is becoming increasingly difficult and expensive for universities to perform functions of socialization and certification, the college, not the university, is the appropriate institution for performing those functions. He argues further, the present universities should, to the greatest possible extent, abandon the function of undergraduate socialization and certification to institutions primarily engaged in them, and reserve their own efforts for higher levels of training, the tasks of adapting scientific and technical knowledge and incorporation of it into the existing body of learning.

-- National Board on Graduate Education

"Informal Notes on the Conference - Airlie Conference on the Support of Graduate Students, August 2-4, 1971" (Mimeographed.)

This mimeographed report describes the discussions which lead to the establishment of the National Board on Graduate Education and its role vis-a-vis the problems facing graduate education.

-- National Research Council

Report on the Conference on Predoctoral Education in the United States

Washington, D.C.: National Research Council, 1969.

This report is an attempt to summarize discussion at the conference held at Woods Hole, August 24-27, 1969. The conference considered the trends and actions affecting the stability of graduate education in the United States.

-- Stanford University

The Study of Education at Stanford: Part VII, Graduate Education

Stanford, California: Stanford University Press, 1969.

This is one of a series of special committee reports submitted to the Stanford University community for its consideration.

The report includes a discussion of selected issues in graduate education, recommendations, proposals for further consideration, and extensive appendix materials. Its first and major recommendation, that a commission be created to study in greater depth Stanford's problems in graduate education, emphasizes that the report is basically a working paper. Where the issues were

felt to be clear and the desired direction unambiguous, the authors make formal recommendations. For the most part, however, they present proposals needing additional scrutiny and discussion by all members of the Stanford community. With a view to starting this process, they include as appendices several resource papers that discuss a variety of aspects of graduate education and provide information, perspectives, and interpretations that extend -- and occasionally diverge from -- the material in the body of the report.

In the winter quarter of 1968, the Steering Committee sent to all Ph.D.-granting departments a tentative statement of its views in selected "problem" areas and requested departments to respond to the following twelve questions: 1) Should the route to the Ph.D. be broadened so as to permit award of the degrees to students whose primary interest is a teaching rather than a research career? Or would you prefer the establishment of a teaching degree such as the M.Phil.? On the other hand, do you find the present program and degree structure satisfactory? 2) Should dissertation specifications be amended so as to permit an alternative to the present research emphasis? 3) Should Ph.D. candidates be required to do some intensive supervised teaching as a regular part of their graduate program? 4) Should the graduate course structure and calendar be more flexible than at present? 5) Should faculty evaluation and judgment, more thorough comprehensive examinations, and the accomplishment of certain specified tasks or projects, replace courses and units as a principal measure of progress to the Ph.D.? 6) Do you favor a plan under which each graduate student is attached to a faculty tutor and the tutor assumes major responsibility for guiding and evaluating the student's progress? 7) Should the present nine-quarter residence requirement be dropped? 8) Should course letter grades be dropped as a measure of graduate student performance, to be replaced by evaluative statements that would become part of the student's record? 9) Should a more refined system of evaluating performance in comprehensive written and oral examinations be introduced to replace the present simple pass-fail structure? 10) Do you favor more active recruiting of graduate students? 11) Should Stanford undergraduates be eligible for admission to your graduate department for full Ph.D. study? For a shorter period of graduate study preliminary to Ph.D. work elsewhere? 12) What other major problems (excluding budgetary problems) confront your graduate programs, and what solutions do you recommend?

A summary of the responses to these questions is included.

PLANNING

-- Education Commission of the States

"Graduate Education in the Next Decade"

Compact, September 1971, p. 20.

This is a brief resumé of a clinic session from the Report of the Fifth Annual Meeting of the Education Commission of the States, "Educational Goals and Public Priorities. Too much growth and too little money was the central theme discussed at the session. Resource consultant, John Folger, pointed out

that the number of doctorates conferred has tripled in the last ten years. Panelists discussed the respective roles of the federal government, state governments, and educational institutions in assuming responsibility for review and evaluation of graduate educational needs, the fields in which programs should be offered, and responsibility for budgetary support of programs. The report calls for a joint effort in the formulation of a national policy on graduate education.

-- Magoun, H. W.

"Geographic and Institutional Aspects of Graduate Education and Research"

Graduate Education Today and Tomorrow. Leonard J. Kent and George P. Springer, editors. Albuquerque: University of New Mexico Press, 1972.

The author reviews some of the geographic and institutional factors that are likely to influence developments in graduate education and research in the coming decades. Recognizing that many of these factors are outside the control of the educational community, he feels that considerable information about them becomes available annually and a review of that information may point to directions and opportunities, as well as identify constraints, in educational planning for the future.

He examines, for example, such factors as the distribution of population and total personal income by states, dimensions and productivity of graduate education by states, the overall institutional standings in graduate education and research, and several others. Included are several useful tables and a bibliography.